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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,628	08/01/2003	Bradley J. Howard	2269-5862US (02-1563.00/	4766
24247	7590	01/10/2006	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			DHINGRA, RAKESH KUMAR	
			ART UNIT	PAPER NUMBER

1763

DATE MAILED: 01/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/632,628		HOWARD, BRADLEY J.	
	Examiner		Art Unit	
	Rakesh K. Dhingra		1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2005.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 and 41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 and 41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1) The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites the limitation "one or more of first, second and third power generators coupled to each one of upper and lower electrodes" which is not covered in specification. Paragraphs 0008, 0009 of the specification disclose "first, second, third power generators which are coupled to corresponding upper and lower electrodes for generating power signals" and as shown in Figure 1 the power generators are coupled to either the upper or lower electrodes, but do not disclose "one or more of first, second and third power generators coupled to each one of upper and lower electrodes" that is "one" power generator coupled to both (upper and lower) electrodes or two/three power generators coupled to both (upper and lower) electrodes.

2) The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 1, 16, 41 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention because of the following:

1) Claims 1, 16, 41 recites the limitation "one or more of first, second and third power generators coupled to each one of upper and lower electrodes". a) This limitation implies the reactor having either of one, two or three generators. b) Further, this limitation can be interpreted as only one generator connected to each one of upper and lower (both) electrodes or more than one generator (either two or three) be connected, to both (upper and lower) electrodes. The amended claim limitation does not seem to match with the disclosure (Figure 1). Therefore for the purpose of examination on merits, this claim limitation has been interpreted as "each of upper and lower (both) electrode is coupled to one or more of first, second and third power generators". Appropriate correction/clarification is required.

Response to Arguments

Applicant's arguments with respect to claims 1-24, 41 have been considered but are moot in view of the new ground(s) of rejection since claims 1, 16, 41 have been amended by applicant by adding new limitations "one or more of" and "each" and further as explained below:

1) Obviousness rejection of Claims 1, 2 based on DeOrnellas et al (US Pub. No. 2002/0139665) in view of Corn et al (US Patent No. 4,585,516).

Also, applicant has contended that "upper electrode 26" is a typographical error in the office action of 7/27/05 and that the same should read "upper electrode 24".

Examiner responds that "upper electrode 26" is correct and not a typographical error since as per broad interpretation of the claim (claim did not recite "upper" electrode facing "lower" electrode) electrode 26 is "upper" that is arranged at a higher location

with respect to lower electrode 28 (US PG Pub. No. 2002/0139665 to DeOrnellas et al – Figure 1).

Applicant further argues that proposed combination of DeOrnellas et al and Corn et al do not teach the amended claim limitation. In this connection attention is invited to Claim Rejections - 35 USC § 112 regarding Claim 1 as explained above wherein the amended claim has been interpreted as “each of upper and lower (both) electrode is coupled to one or more of first, second and third power generators”. In the light of examiner's response regarding “upper electrode 26” and the examiner's interpretation of claim 1, combination of references by DeOrnellas et al in view of Corn et al read on the amended claim limitation and thus rejection of Claims 1, 2 is maintained.

Further Claim 1 has also been rejected as anticipated by Fink (US PG Pub. No. 2004/0211519) for the embodiment where only one generator is connected to upper and lower electrodes.

2) Obviousness rejection of Claims 1-3, 9-11 based on Roderick (US Patent No. 6,043,607) in view of DeOrnellas et al (US Patent No. 6,492,280).

Applicant argues that obviousness rejections of these claims are improper because it fails to meet the criterion that prior art reference must teach or suggest all claim limitations, since specifically, Roderick reference teaches that only one waveform generator is coupled to an electrode.

Examiner responds that Roderick teaches use of three signal generators 118 sub.n whose waveforms (amplitudes and frequencies) are combined by waveform generator 102 and then split again by power splitter 106 and the required frequency bands are supplied to upper and lower electrodes 126 and 144 through respective matching

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networks 108, 110 respectively. Roderick also teaches that a feedback control device (controller) 300 provides dynamic control of signal characteristics (amplitude, power, frequency etc.) of the three signals generators (Column 4, lines 12-50).

Examiner further responds that since Roderick reference in itself reads on all limitations of amended claim 1, this claim accordingly has been rejected under 35 USC 102 (b) as explained below.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since Roderick reference itself teaches all limitations of claim 1 as explained above, DeOrnellas et al reference was combined with Roderick reference as a 35 USC 103 (a) rejection, since the combination teaches the limitations of dependent claims 2,3, 9-11. Accordingly claims 1, 2-3, 9-11 are rejected as explained below.

3) Obviousness rejection of Claims 1, 2, 4 and 12-23 based on Salimian et al (US Patent No. 5,656,123) in view of DeOrnellas et al (US Patent No. 6,492,280).

Applicant's arguments that both these references do not teach control of generator coupled to upper electrode or controlling of generators on the upper and lower electrodes have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is

made in view of claims 1, 16 being amended by the applicant by combining teachings of Tsuchiya et al with those of Salimian et al in view of DeOrnellas which read on the amended claim 1 and the dependent claims 2, 4, 12-23. Accordingly claims 1,2,4,12-23 have been rejected as explained below.

4) Obviousness rejection of Claims 1, 2, 5-11, 41 based on DeOrnellas et al (US Pub. No. 2002/0139665) in view of Corn et al (US Patent No. 4,585,516) and further in view of Tsuchiya et al (US Patent No. 5,716,534).

Regarding Claims 1,2,5-11 applicant argues that cited references do not render the amended claim 1 and dependent claims 2, 5-11 obvious in view of no power supply/generator being connected to upper electrode in DeOrnellas et al reference.

Examiner responds that as explained above power generator 30 is connected to "upper electrode 26" and thus Claims 1, 2 are rejected as explained below.

Examiner further responds that reference by Tsuchiya et al when combined with DeOrnellas in view of Corn et al reads on the limitations of claims 5-11 and accordingly these claims have also been rejected as explained below.

Regarding Claim 41 applicant argues that reference by Tsuchiya et al when combined with DeOrnellas in view of Corn et al does not read on the limitations of amended claim by way of obviousness.

Examiner responds that as explained above power generator 30 is connected to "upper electrode 26" in the reference by Deornellas et al. Further, reference by Tsuchiya et al when combined with DeOrnellas in view of Corn et al reads on the limitations of claim 41 and accordingly claim 41 has been rejected as explained below.

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5) Obviousness rejection of Claims 16, 24 based on Salimian et al (US Patent No. 5,656,123) in view of Corn et al (US Patent No. 6,492,280) and further in view of Roderick (US Patent No. 6,043,607).

Applicant argues that obviousness rejection of dependent claim 24 be withdrawn since it depends on non-obvious independent claim 16.

Examiner responds that both the independent claim 16 and its dependent claim 24 have been rejected (as explained below) as being unpatentable over Salimian et al in view of DeOrnellas et al and Tsuchian et al. Accordingly Claim 24 has been rejected as explained below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Kalyanam (US PG Patent No. 6,491,978).

Regarding Claim 1: Kalyanam teaches an apparatus (Figure 4) [plasma enhanced mode] that comprises a process chamber 472, a RF source 494 (only one generator) connected to showerhead 440 and pedestal 432. Kalyanam also teaches a

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microprocessor (controller) 499 that monitors and controls the process performed in the apparatus (Column 14, lines 40-60).

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Roderick (US Patent No. 6,043,607).

Regarding Claim 1: Roderick teaches an apparatus (Figures 1-3) that comprises first, second, third generators 118.sub.1, 118.sub.2, 118.sub.3 coupled to upper and lower electrodes 126, 114 and whose waveforms (amplitudes and frequencies) are combined by waveform generator 102 and then split again by power splitter 106 and the required frequency bands are supplied to upper and lower electrodes 126 and 144 through respective matching networks 108, 110 respectively. Roderick also teach a feedback control device (controller) 300 (Column 3, lines 1-20) that provides dynamic control of signal characteristics of the three signals generators (column 4, lines 12-50).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeOrnellas et al (US Pub. No. 2002/0139665) in view of Corn et al (US Pub. No. 4,585,516).

Regarding Claim 1: DeOrnellas et al teach a plasma apparatus (Figure 1), comprising upper electrode 26, lower electrode 28 and power generators 30, 32, 34 coupled to upper and lower electrodes (Paragraphs 0023, 0024).

DeOrnellas et al do not teach controller for controlling selectively activating the generators.

Corn et al teach an apparatus (Figure 1) that has a control means (controller) 27 for controlling the signals applied to the reactor to improve etching capability of the apparatus (Column 2, lines 45-55 and Column 1, lines 36-38). Corn et al further teach that the apparatus uses at least two (implying there could be three sources) sources of RF power and the RF means could have different duty cycles (Column 1, lines 42-45). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use control means (controller) as taught by Corn et al in the apparatus of DeOrnellas et al to achieve improved etching capability.

Regarding Claim 2: DeOrnellas et al teach that first power generator 30 is connected to upper electrode 26 and second and third power generators 32, 34 are coupled to the lower electrode 28.

Claims 2, 3, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roderick (US Patent No. 6,043,607) in view of DeOrnellas et al (US Patent No. 6,492,280).

Regarding Claim 2: Roderick teaches all limitations of the claim as explained above.

Roderick does not specifically teach the electrodes to which the generators are coupled.

DeOrnellas et al teach an apparatus (Figure 6) that has generators 48, 50 coupled to lower electrode 42 for obtaining wafer etching with straight vertical sidewall profiles (Column 4, lines 50-65).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to replace power source to the lower electrode with plural power generators as taught by DeOrnellas et al in the apparatus of Roderick to achieve wafer etching with vertical sidewall profiles (Column 2, lines 25-30).

Regarding Claims 3: DeOrnellas et al teach that RF sources 48 has a frequency of 450 KHz and RF source 50 has frequency of 13.56 MHz, that is frequency of second generator 50 is three times that of third generator 48. (Column 5, lines 1-10).

Regarding Claims 9-11: Roderick teaches that feedback control device 300 (controller) dynamically controls one or more signal characteristics like amplitude, power, frequency etc of the signal produced by each of the generators (Column 4, lines 15-20).

Claims 1, 2, 4, 12-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Salimian et al (US Patent No. 5,656,123) in view of DeOrnellas et al (US Patent No. 6,492, 280) and Tsuchiya et al (US Patent No. 5,716,534).

Regarding Claims 1, 2, 16, 24: Salimian et al teach an apparatus (Figure 1) that comprises a vacuum chamber 14, generators 12, 16 coupled to upper and lower electrodes 20, 22 (column 5, lines 35-55).

Salimian et al do not teach third power supply and controller.

DeOrnellas et al teach an apparatus (Figure 6) that has generators 48, 50 coupled to lower electrode 42 and a controller 54 for obtaining wafer etching with straight vertical sidewall profiles.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use third power generator and controller as taught by DeOrnellas et al in the apparatus of Salimian et al to achieve wafer etching with vertical sidewall profiles.

Salimian et al in view of DeOrnellas et al teach all limitations of the claims except control of generator connected to upper electrodes and the remaining generators.

Tsuchiya et al teach an apparatus (Figures 1, 30-33) that uses CPU (controller) 20 to control power supplies 18, 29 for ON/OFF (active /inactive) modes to optimize the etching parameters (Column 8, line 65 to Column 9, line 15 and Column 12, lines 45-65 and Column 13, lines 1-25). Tsuchiya et al further teach that etching parameters can be optimized by appropriately selecting the parameters including phase difference and the power ratio of the generators (column 8, lines 20-25).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use controller as taught by Tsuchiya et al in the apparatus of Salimian et al in view of DeOrnellas et al to optimize the etching parameters.

Regarding Claims 4: DeOrnellas et al teach that two RF sources 48 (450 KHz) and 50 (13.56 MHz) coupled with lower electrode 42, and a controller 54 for sequencing the power supplies (column 4, lines 65-67 and column 5, lines 1-10). Thus frequency of first power generator 12 (60 MHz – Salimian et al) is greater than frequency of second power generator 50 (13.56 MHz – DeOrnellas et al) and that of third power generator 48 (450 KHz – DeOrnellas et al).

Regarding Claims 12, 18, 19: Salimian et al in view of DeOrnellas teach that the first power generator 12 (Salimian et al, Figure 1, Column 4, lines 50-52) is capacitively coupled to the upper electrode 20 and the second and third power generators 48, 50 (DeOrnellas et al, Figure 6, Column 7, lines 55-60) are capacitively coupled to the lower electrode 42.

Regarding Claims 13, 21: DeOrnellas et al teach that the second power generator 50 operates in MHz range frequencies at about 1 MHz and up to multiples of 13.56 Mhz (includes 13.5 Mhz to 60 Mhz) can be used (column 5, lines 1-10).

Regarding Claims 14, 22: Salimian et al teach that for the first power generator 12 signal in the range of 30 MHz to 300 MHz (includes 40 Mhz to 100 MHz) could be used (column 5, lines 65-68).

Regarding Claims 15, 23: Salimian et al teach that for the third power generator 16 signal could be applied in the range of 0.1 MHz to about 30 MHz (includes 1 MHz to 13.5 MHz); (column 6, lines 1-5).

Regarding Claim 17: Salimian et al teach (Figure 1) that upper electrode 20 is arranged above the wafer table 46.

Further DeOrnellas et al teach (Figure 6) that lower electrode 42 is coupled with wafer chuck (table) (column 4, lines 55-60).

Regarding Claims 20: DeOrnellas et al teach that RF sources 48 has a frequency of 450 KHz and RF source 50 has frequency of 13.56 MHz, that is frequency of second generator 50 is three times that of third generator 48 (column 5, lines 1-10).

Claims 5-11, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeOrnellas et al (US Pub. No. 2002/0139665) in view of Corn et al (US Patent No.

4,585,516) as applied to claims 1, 2 and further in view of Tsuchiya et al (US Patent No. 5,716,5340).

Regarding Claims 5-11: DeOrnellas et al in view of Corn et al teach all limitations of claims as explained above except placement of power generators in active/inactive mode.

Tsuchiya et al teach an apparatus (Figures 1, 30-33) that uses CPU (controller) 20 to control power supplies 18, 29 for ON/OFF (active /inactive) modes to optimize the etching parameters (, column 9, lines 1-15 and column 12, lines 45-65 and column 13, lines 1-25). Tsuchiya et al further teach that etching parameters can be optimized by appropriately selecting the parameters including phase difference and the power ratio of the generators (column 8, lines 20-25).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use controller as taught by Tsuchiya et al in the apparatus of DeOrnellas et al in view of Corn et al to optimize the etching parameters.

Regarding Claim 41: Tsuchiya et al teach an apparatus (Figures 1, 30-33) that uses CPU (controller) 20 to control power supplies 18, 29 for ON/OFF (active /inactive) modes to optimize the etching parameters (column 9, lines 1-15 and column 12, lines 45-65 and column 13, lines 1-25). Tsuchiya et al further teach that etching parameters can be optimized by appropriately selecting the phase difference and the power ratio of the generators (column 8, lines 20-25).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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